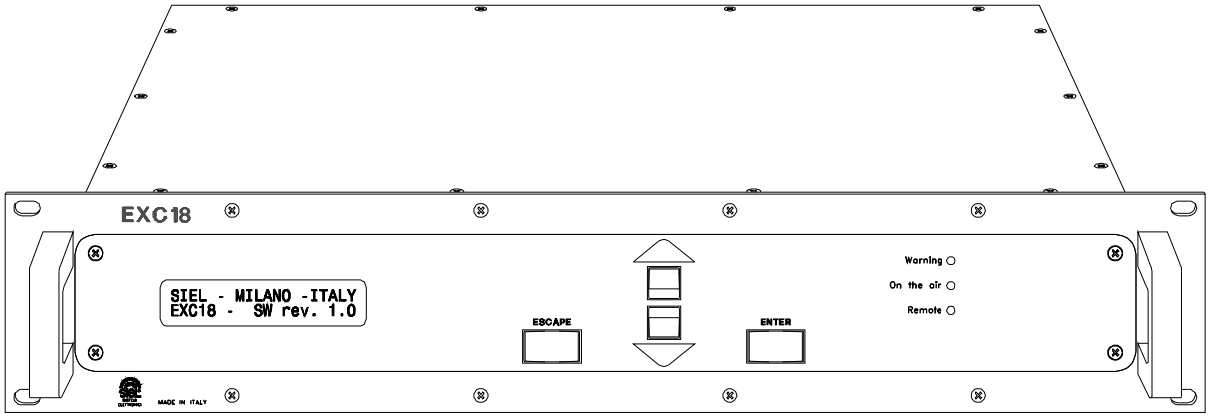
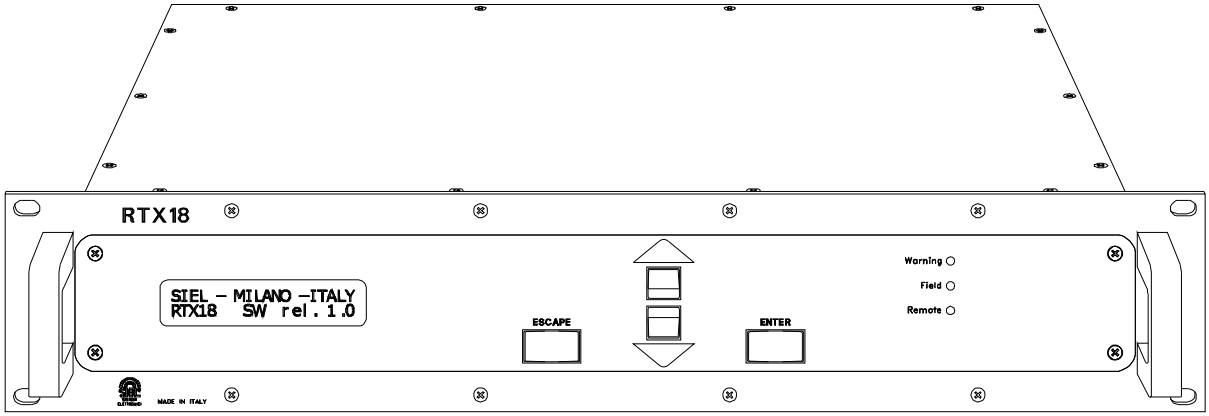
EXC/RTX18
BROADCAST STL
VHF/UHF/SHF
200 ÷ 960 & 1400 ÷ 2600 MHz

USER AND MAINTENANCE MANUAL





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EXC/RTX18

BROADCAST STL FAMILY SERIES
VHF/UHF (200 ÷ 960) & SHF 1400 ÷ 2600 MHz

INTRODUCTION

The EXC/RTX18 series stls are the result of experience gained by SIEL during years of producing FM broadcast equipment, transmitters, stl and stereo encoders.

These radio links were specifically designed to comply with the latest international standards and the requirements of advanced broadcasters, meeting tighter specifications than usually required, at an affordable cost.

Great care was spent into producing a Hi-Fi-quality modulated signal, with low residual noise and distortion. The RF signal is also free from spurious and harmonic components to a higher degree than required by CCIR, European, USA and most other national standards.

To obtain this outstanding performance, SIEL strongly recommend to rely on qualified personnel to install and verify the equipment which makes up the radio station, i.e. the stl, the transmitters and the power amplifiers, the corresponding antennas, cables and connectors. This will assure to achieve the best performance and stability in time.

To this aim, SIEL especially recommend that their equipment should not be tampered with by unskilled personnel and its after-sale service is available to customers for any technical problem. Before proceeding to installation, please carefully read at least the general installation part of this manual, to gain confidence with the equipment.

These equipment are very stable and changes to the internal pre-setting other than frequency and few other options are not usually required but, if they are, once again they must be done by skilled personnel, with proper instrumentation and service documentation. Improperly tampering with the settings may harm the apparatus or jeopardize the guaranteed performance.

THIS EQUIPMENT COMPLIES WITH ALL RELEVANT CE EMI/EMC AND SAFETY REQUIREMENTS, **ETSI EN300454-1/2 AND ETS301489-01/11** STANDARDS.

NO INTERNAL ADJUSTMENT OR PRESETTING IS REQUIRED DURING NORMAL OPERATIONS. THE APPARATUS SHALL BE PROPERLY EARTHED AND BE OPERATED WITH ALL THE COVERS CLOSED TO PREVENT ELECTRICAL HAZARDS AND COMPLY WITH EMC STANDARDS.

——— MAINS VOLTAGE MAY KILL ———

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GENERAL DESCRIPTION

The EXC18 transmitter and its companion RTX18 receiver are the core of a high quality, synthesised studio-to-transmitter link (stl), to be used for broadcast repeaters in conjunction with any standard FM or AM transmitter. Design of this apparatus derives from the well-known EXC/RTX16 series stl coupled with digital control techniques used on the EXC25 FM transmitter. It allows the reception of mono or stereo signals and its retransmission without using any additional stereo-coder on the receiving end: in both cases the LF output signal from the receiver must be sent to the stereo input (linear or not pre-emphasised) of the local FM rebroadcast transmitter.

The stl is built for several different frequency ranges from VHF to SHF. While the exterior cabinet, the controls, the basic circuitry and the performances are the same, some internal components vary as required to cover this wide frequency band. Usually these components are the local oscillator, the power amplifier and the input/output filters

Two main models are built: one for the 200÷960 MHz and the other for the 1400÷2600 MHz range, in which the internal components and modules are exactly the same, with some minor tuning adjustments. These bands are further subdivided in small 10 to 50 MHz factory adjusted sub-ranges, which must be specified in the order. In the preset sub-range, the frequency and power may be freely changed on the field.

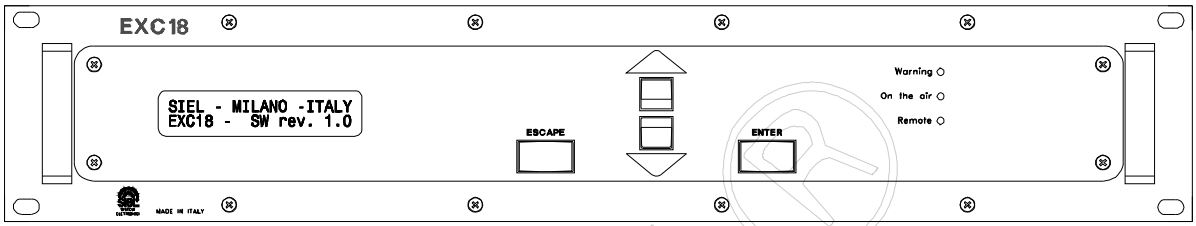
Being the apparatuses completely digitally controlled, they are extensively on field programmable by front panel or remotely in every respect. The alphanumeric display permits easy and accurate metering, adjustment and continuous monitoring of modulation levels, power, operation and internal parameters. All these information may be externally available on the same RS232 I/O port that may be used to remotely control the transmitter. In addition to the serial I/O, some signals and controls are available on a parallel I/O socket for easy interfacing with others analog controllers or supervisory systems. A powerful 3-levels password management permits a very high degree of security and privacy as may be required in different situations.

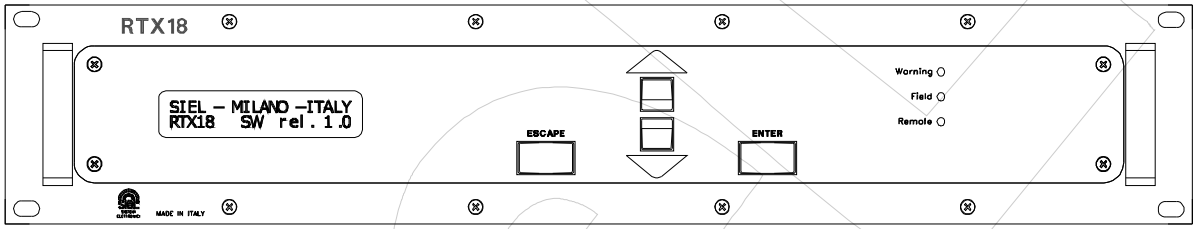
As imposed by various national standards, the stl transmitter incorporates sophisticated low-pass audio filters on mono and stereo channels, and a sharp acting modulation limiter which may be preset at a peak deviation slightly higher than 75 kHz to over 170kHz or disconnected. The LF input and output levels are precisely adjustable over a broad range, by means of 0.5dB stepwise variable attenuators. The transmitter has also an auxiliary input, specifically designed for RDS and SCA encoders. A modulation monitor output permits to control other transmitters or STL's with the same internally processed high-quality mpx signal. Furthermore, the system is optimised to be compatible with external digital companding encoder/decoders and to provide RDS and SCA signals, with almost no attenuation.

Optional top-quality stereo encoder/decoder boards may be factory installed on the transmitter/receiver or field retrofitted with minimum required technical skill. The powerful internal software and monitoring functions recognise their presence and enable the functions. A universal switch-mode power supply permits operation in the extended 95-250 Vac range with no intervention and a 24 V back-up battery input is provided too.

TECHNICAL FEATURES

FRONT PANEL COMMANDS AND SIGNALLING





The transmitter and receiver set are fitted in the same kind of cabinet and are extremely similar on the front view.

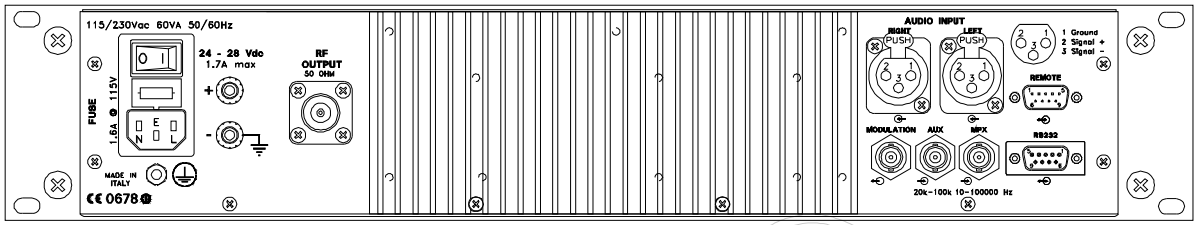
Both the equipment are clean and easy to control from the front panel. The wide alphanumeric display and the keyboard permit a simple self-explanatory menu-driven navigation through the various options.

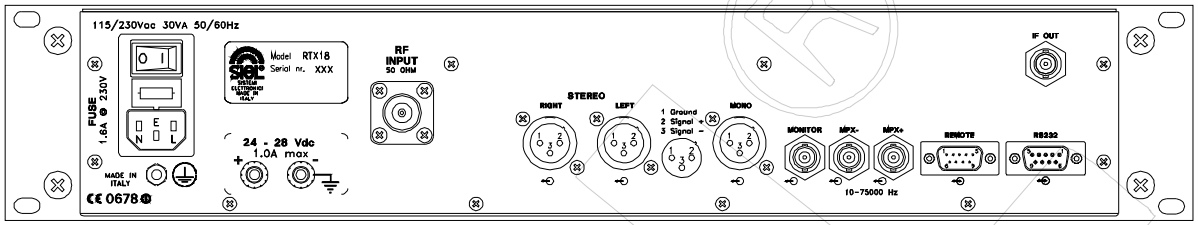
Great care was taken in the design of the software to allow natural feeling with the controls to permit operation and programming in every respect of the apparatus without needing to extensively read the user-manual.

Three leds signal at a glance proper functioning and warning states. Two of them, the "*Warning*" led and the "*Remote*" one are common to both equipment. An "*On the air*" led signals the RF output on the transmitter, while correspondingly a "*Field*" led on the receiver recognises an adequate received field strength.

The optional multilevel password management prevents tampering with the most critical options and data to unauthorised people.

REAR PANEL CONNECTORS





All equipment inputs and outputs are allocated on the rear panel. They are:

On both equipment:

- The mains supply IEC320-type outlet, which incorporates the mains switch and the fuses. An additional earth screw for system earthing and a 24V-battery backup socket pair.
- The audio channels input/output sockets on balanced XLR-type connectors
- The inverted wired RS232 DB9 female remote serial control port
- The parallel control port, DB9 male type
- The RF antenna connector, N-type

On the transmitter only:

- The wide-band external processed stereo or composite signal input on a grounded unbalanced BNC connector
- A frequency limited (20k ÷ 100kHz) auxiliary channel input on a grounded, unbalanced BNC connector
- The LF modulation output for monitoring, RDS external synchronisation or re-broadcasting purpose, BNC-type

On the receiver only:

- The main composite signal output on two BNC-type connectors in antiphase, permitting direct drive of two separate transmitters or only one in balanced mode.
- The filtered/de-emphasised mono signal on a balanced male XLR-type connector.
- An optional stereo-decoded output on a couple of balanced male XLR-type connectors.
- A buffered LF monitor, BNC-type connector that may be internally connected as an additional composite, wide-band or mono signal output.
- An IF monitor, BNC-type connector.

No internal or external preset is needed to correctly perform on 115/230Vac mains range

TECHNICAL SPECIFICATIONS

- Factory preset frequency ranges
  - 215÷245 Mhz 240÷270 Mhz
  - 300÷340 Mhz 340÷380 Mhz
  - 400÷440 Mhz 430÷470 Mhz
  - 810÷850 Mhz 850÷890 Mhz
  - 890÷930 Mhz 930÷960 Mhz
  - 1429÷1433MHz 1510÷1530MHz
  - 1660÷1670MHz 2367.5÷2372.5MHz
  - 2440÷2.450MHz 2468.1÷2483.3MHz
  - Other sub-ranges on request

- Modulation: FM, 75 kHz peak dev.
  180kF3E mono
  256kF3E stereo
- Synthesis step: 10kHz (215÷960 Mhz)
  100 kHz (1.4÷2.6 Ghz)

- Composite Mpx output response:
  15 Hz ÷ 67 kHz +0.1/-0.5dB
  <-6 dB @ 100 kHz
  <-20 dB @ 125 kHz

- Monitor output wide-band response:
  15 Hz ÷ 100 kHz +0.1/-1.5dB
  -3 dB typ. @ 125 kHz
  -6 dB typ. @ 160 kHz

- Mono/stereo decoded response:
  30 Hz ÷ 15 kHz ±0.2dB

- S/N ratio (30÷20000Hz rms):
  >70 dB, 76 typ. mono
  >66 dB, 72 typ. stereo

- Modulation distortion (100% dev.):
  @ 1 kHz/
  - mono ≤0.1% 0.03% typ.
  - stereo, 1ch ≤0.30% 0.20% typ.

  @ 30÷7500 Hz
  - mono ≤0.25% 0.12% typ.
  - stereo, 1ch ≤0.30% 0.20% typ.

- Stereo crosstalk (typical):>50 dB (400÷10000 Hz)
  >40 dB (100÷15000 Hz)

- I/O lines: Alarm, RF/LF disable, Low RF field
  RS232 for monitoring and control

- Mains requirements:
  95 / 250 Vac 50/60 Hz
  22.0 ÷ 28.0 Vcc

- Operating temperature range:
  0÷35° C recomm.
  -10÷45 °C max.

EXC18 TRANSMITTER ONLY

- Frequency error: <2,5 ppM
- Frequency drift: <1 ppM/year

- RF output power: 7W / 15W (215÷960 Mhz)
  2W / 5W (1.4÷2.6 Ghz)
- Max allowed reflected power: 1W / 2W

- RF harmonic products: <-60 dBc
- RF spurious products: [redacted]dBc, -80 dBc typ.
- RF output: 50 ohm, N connector

- Audio/Mpx input level: -3.5 ÷ +12.5dBm
  @ ± 75kHz deviation
- Audio/Mpx input:
  10k ohm/600 ohm, bal./unbalanced

- Common mode rejection:
  >50 dB, >60dB typ. (20÷15000 Hz)

- Audio input connectors: female XLR type

- Auxiliary channel input level:
  -12.5 ÷ +3.5dBm @±7.5 kHz dev.
  -24 ÷ -8dBm @±2 kHz dev.

- Aux channel input: 10k ohm / BNC-type

- Monitor LF output:
  0 ÷ +10 dBm @ ±75kHz dev.

- Pre-emphasis time constant: 0/50/75 µs ±2%

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- S/N noise ratio (30÷20000Hz rms):
  >70 dB, 76 typ. (mono)
  >66 dB, 72 typ. (stereo)

- Modulation distortion, 30÷15000 Hz:
  <0.02% @ 75kHz dev.

- Stereo crosstalk: >50 dB (100÷5000 Hz)
  >45 dB (50÷15000 Hz)

- Audio channels response:
  30 Hz ÷ 15 kHz ±0.1dB

- Out of band audio attenuation:
  >50 dB @ F≥19 kHz

- Deviation limiter: 0 ÷ +7.1 dB, adjustable

- Mpx composite response:
  10 Hz÷100kHz ±0.1dB

- Auxiliary channel response:
  10÷ 100 kHz ±0.2dB

- I/O lines: RF disable, RF power, On-the-Air, Alarm.
  RS232 control and monitoring

- Mains absorption: 50 Wmax @ 90/250Vac (Po= 5W)
  80 Wmax @90/250Vac (Po=15W)
- Battery absorption: ≤1.8A @ 24 Vdc (Po= 5W)
  ≤3.0A @ 24 Vdc (Po= 15W)

- Dimensions, without handles: 19" 2 un. std. rack
  483 x 88 x 334 mm

RTX18 RECEIVER ONLY

- Noise figure: ≤10 dB

- Image frequency rejection: ≥50 dB 60 typ.

- Dynamic selectivity: >+10dB typ @ δF=300 kHz
  >+35dB typ @ δF=500 kHz
  >+45dB typ @ δF=1.0 MHz

- AM suppression: >45 dB

- Usable input level: -90 ÷ -10dBm
  (7µV÷70mV)

- Sensitivity (typical): Sin= -90dBm (7µV) mono
  (S/N=60dB) Sin= -70dBm (70µV) stereo

- IF monitor output: 10.7 MHz / 0dBm

- Wide-band demodulated output response:
  15 Hz ÷ 120 kHz +0.1/-3dB

- Wide-band demodulated output level: +6dBm

- MPX output level: -1.5 ÷ +12 dBm,
  [illegible]step

- Mpx output response:
  15 Hz ÷ 67 kHz +0.1/-0.5dB

- mono or stereo decoded response:
  30 Hz ÷ 15 kHz ±0.1dB

- Out-of-band mono or stereo audio response:
  >50 dB @ F≥19 kHz

- De-emphasis time constant: 0/50/75µs ±2%

- S/N ratio (30÷20000 Hz. rms):
  >70 dB, 76 typ. mono
  >66 dB, 72 typ. stereo

- Modulation distortion @ 1kHz / 100% dev.:
  mono ≤0.1% 0.03% typ.
  stereo, 1ch ≤0.30% 0.20% typ.

- Stereo crosstalk :>50 dB (100÷5000 Hz)
  >45 dB (50÷15000 Hz)

- I/O lines: LF disable, Low RF field, Alarm.
  RS232 control and monitoring

- Mains absorption: 20 Wmax @ 90 / 250 Vac
- Battery absorption: ≤0.6A @ 24 Vcc

- Dimensions, without handles: 19" 2 un. std. rack
  483 x 88 x 334 mm

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REMOTE CONTROL FUNCTIONS

Both the Stl transmitter and receiver are completely presettable and controllable by the front panel keyboard and display. The same functions are remotely possible through the serial RS232 port, which is located on the rear of each equipment. To control the equipment is anyway required some purposely developed software which is not available at the present as a standard option. Some simple demonstration program may be given only as a start point to development.

In addition to the serial port, a parallel one is provided on the rear, on which are wired some signal and control wires. Both the 2 ports are described in the following paragraphs.

RS232 port

The RS232 port manages only Tx, Rx and Return data signals, with no handshake. Being the two former signals inverted wired to the port, it needs a simple straight wired serial cable with appropriate connectors to connect to a PC. Usually a female DB9 or DB25 female goes to the PC port and a male DB9 connector at the transmitter end. Appropriate software is needed for communication. Do not connect the cable with either transmitter or PC on.

Parallel remote control port

This port accommodates some lines for simple direct control / monitor on a DB9 male connector. They are:

TRANSMITTER:

- Pins 1, 5, 8 *Ground*.
- Pin 2, *On The Air*: a +12V/10kW signals that the transmitter deliver substantial RF power. It is not granted that the output power is the preset one.
- Pin 3, *Direct power*: a signal proportional to direct power is present, with a pseudo square law. Range is 0-5Vdc / 1kΩ impedance. Full power voltage usually ranges 3,5 to 4 V.
- Pin 6, *RF enable*: a shorted circuit to ground disables RF. Maximum voltage and current available are nearly +10V and 1mA
- Pin 7, *Alarm*: logic low signal means alarm. Correct functioning is signalled by +12V with10kΩ impedance. Maximum current sinking capability <10mA.
- Pins 4 & 9: future upgrades

RECEIVER:

- Pins 1 & 5 *Ground*.
- Pin 2, *"modulation on"*: a low logic state signals modulation is present on the received signal; on the contrary, a high logic state, + 12V con 10kΩ, warns on modulation loss. This function is optional and depends on the firmware. It is not comprised as a standard in the actual revision.

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